How to Finance Climate Change Policies? Evidence from Consumers' Beliefs*

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April 22, 2022

Abstract

Climate change policies have been rising to the top of the global political agenda, but how should governments finance them? Public economists propose solutions based on economic theory, but their political feasibility depends on voters' support, and ordinary households often neglect economic theory and have different views about efficiency and fairness. We design a large-scale information experiment to assess a representative population's beliefs about alternative forms of financing. We randomly provide information about which groups contribute more to or benefit from climate change and compare the support for alternative financing schemes across informed and uninformed consumers. Informed consumers strongly support the introduction of a VAT-style CO2 tax after learning that the rich contribute more to climate change than the poor, but do not support increasing taxes on older people when learning that they also pollute more. Moreover, consumers who learn that certain populations, due to luck, gain economically from climate change strongly *oppose* redistribution from gainers to losers of climate change. Consumers also oppose financing policies to fight climate change via public debt, implying higher costs for future generations. Market-based solutions, such as private insurance for those exposed to climate-change risk, are strongly opposed across the board.

JEL classification: D64, D84, D91, F38, H23, Q54

Keywords: Climate Policy, Fiscal Policy, Taxation, Expectations, Inequality.

*We thank several seminar and conference participants for valuable comments. Weber gratefully acknowledges financial support from the Fama Research Fund and the Fama-Miller Center and Peichl from the German Science Foundation via CRC TRR 190 (project number 280092119).

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I Introduction

Designing and implementing policies that slow down climate change and, according to their proponents, improve societal welfare has risen to the top of the global political agenda (UN-IPCC, 2022).[1] Policies that create incentives to transition to low-carbon emissions are mostly financed by governments, because firms and consumers do not fully internalize the negative externalities of pollution. Transitioning to "green" production also imposes short- to medium-term disruptions in labor markets and in the investment opportunities of firms operating in brown industries, which puts additional pressure on governments' balance sheets.

How should governments finance these climate-change-related expenses? So far, economists have been investigating the optimal financing of climate-change policies based on standard public finance arguments and economic theory (see, e.g., Poterba, 1991; Monitor, 2019). Ultimately, though, the decision of how to finance climate-change policies depends on consumers' political support and consumers often neglect the most basic mechanisms of economic theory (Andre et al., 2021), disagree with their assumptions (D'Acunto et al., 2021b), and have different views about policy efficiency and fairness relative to experts who base their arguments on standard economic models (Stantcheva, 2021). For these reasons, shedding light on ordinary consumers' preferences and beliefs about the desirability of different financing schemes for climate-policy-related expenses is crucial to assess their feasibility.

In this paper, we design a large-scale survey that includes an information-treatment experiment to assess a representative population's view about alternative schemes to finance climate-change policies and the economic mechanisms that explain such views. We use an information experiment because unincentivized surveys assessing respondents' attitudes toward different schemes may induce ideological and/or untruthful responses (Bursztyn et al., 2020), which would confound consumers' ideology with their actual

[1] This paper is silent about whether climate change exists, whether human activities contribute to it, or whether it affects welfare. We start from the positive statement that governments and other institutions around the world are committed to implement policies against climate change and study the feasibility of alternative financing schemes.

support for different schemes at the voting poll (Stantcheva, 2021).[2] Moreover, consumers might be uninformed about the theoretical motivations that justify alternative financing schemes and might change their views once they learn about them. An information-treatment experiment thus allows us to assess whether information campaigns have the potential to change consumers' beliefs relative to consumers' responses in unprompted opinion polls.

To implement our research design, we cooperated with one of the most reputable opinion polling institutions in Europe—*forsa*. Through *forsa*, we added information treatments and questions eliciting respondents' beliefs to a nationally representative panel of Germans surveyed before the Federal election in 2021.[3] In the survey, we elicit respondents' support for five prominent forms of financing climate-change-related expenses proposed by economists and discussed in the public debate—a CO2 tax (sales or VAT-style tax based on the extent of CO2 emissions needed to produce a good or deliver a service), an increase in the marginal income tax rate for high-income earners, a tax on individuals and firms gaining from climate change, increases in public debt, and a market-based solution—private insurance for individuals and firms exposed to climate-change risks.

Before stating their views on the desirability of different financing policies, respondents randomly read one of four different, truthful pieces of information:[4] the control group reads a short paragraph about the fact that Germany's Federal Environmental Agency officially reported that climate change has economic consequences for Germany. The three treatment groups read the same paragraph, plus an additional sentence that differed across groups: one group was informed that high-income households contribute more to climate change than low-income households; another group that older individuals pollute on average more than younger individuals; the last group was informed that certain firms and consumers gain from climate change, for instance by facing lower

[2]Haaland et al. (2021) provide an excellent overview on the design of survey experiments and the growing body of work using them across fields of economics.

[3]Germans are on average relatively environmentally friendly. For example, the Green party is part of the government that was elected in September of 2021, subsequent to our survey.

[4]We report the text of the four information treatments in German (original version) and English in the Online Appendix.

costs of production or higher demand in areas that would experience milder climate because of a rise in temperature.

Our information treatments focus on how different population groups contribute more to or suffer less from climate change than others. From an efficiency perspective, groups that contribute more to climate change and/or benefit more from it should contribute more to the financing of climate-change policies. At the same time, ordinary people's beliefs about fairness might translate into supporting higher contribution from groups they deem as privileged, irrespective of the extent to which such groups contribute to climate change (Hvidberg et al., 2021).

And, indeed, we find that consumers' beliefs sway their support for alternative financing schemes in ways that often collide with the principle of economic efficiency. First, subjects who learn that high-income households pollute more than others because they consume more goods and services that create a high amount of CO2 during production are substantially more supportive of a CO2 tax—which they learn through our treatment would be borne more by high-income households. These subjects are also less likely to support public-debt financing, which would shift the burden of climate-change policies to future generations. And, relative to the control group, they are equally (non-)supportive of the other financing schemes—a tax on those who gain from climate change and private insurance for those facing climate-change risk.

At the same time, subjects who learn that older households pollute more than others, and hence that a CO2 tax would affect older households more than younger ones, are not more likely to support this form of financing relative to the control group, nor do they support any other form of financing differently than the control group. In particular, they are not less likely than others to support the issuance of public debt, despite the fact that this scheme shifts the burden of climate-change policies away from the current older generations—who these subjects know contribute more to climate change—to future generations. The ordinary consumers in our sample thus do not seem to believe that polluting more justifies a higher contribution to finance climate change policies through higher taxation if the group that pollutes more is not deemed as a privileged group.

Our third treatment informs subjects that certain subpopulations gain from climate

change. According to standard theory, a transfer from those for whom the externality induced by climate change is positive to those for whom it is negative would be efficient. In stark contrast with this efficiency argument, treated subjects in this arm are substantially more *opposed* to a tax on the gainers of climate change relative to subjects in all other arms. This result resonates with the finding in the public economics literature that ordinary people disapprove of the taxation of earnings obtained by luck, such as inheritances and lottery gains (see, e.g., Weinzierl, 2017; Birney et al., 2006). Subjects who learn about the gainers from climate change are also substantially more opposed to the introduction of a CO2 tax, which might indicate that the support for fighting climate change might decrease once agents learn about the fact that it has beneficial effects for some people.

Overall, subjects' views about the same taxation principle—those who pollute more should contribute more to finance climate-change policies—which is efficient under standard economic theory differs dramatically based on the identity of those groups who pollute more than others. When respondents learn that the rich pollute more they support financing options that require the rich to pay more. By contrast, when they learn that older people pollute more, respondents do not support higher taxes for the elderly, despite the efficiency of this option (Weinzierl, 2011). Even more surprisingly, given the economic theory, respondents are strongly against a transfer from the gainers of climate change to the losers of climate change once they are made aware about the heterogeneous effects of climate change on individual economic outcomes.

Beyond studying consumers' subjective beliefs about alternative financing schemes for climate-change policies, our results have implications for how governments could use communication as a tool to manage consumers' beliefs about such schemes (D'Acunto et al., 2021a). These implications add to the results of Andre et al. (2021), who study the role of social norms, preferences and moral values in shaping individuals' willingness to fight climate change and of Bernard et al. (2021), who find that agents increase their willingness to pay to offset CO2 emissions after being informed about climate-change policies.

The rest of the paper is organized as follows. In the next section, we discuss the financing schemes that we refer to in our information experiment. In section III, we

describe our survey and provide summary statistics for our sample. Section IV elicits respondents' views about different financing schemes based on the answers provided by subjects in the control group. Section V shows the results of the information treatments, section VI concludes.

II The Financing of Climate Change Policies

In our information experiment, we consider five (non-exclusive) schemes to finance climate-change policies that are prominently discussed in the public debate.

The first method is raising tax revenues through a novel form of indirect taxation—a carbon or CO2 tax, that is, a value-added style tax (VAT) based on the extent of CO2 emissions required to produce a good or deliver a service (Poterba, 1991). The introduction of such an instrument has been recently discussed in the European Union (EU) in order to achieve the EU member states' climate goals.[5] The design of the proposed CO2 tax would resemble that of a VAT: it would be passed on in every stage of the production of a good so that it is effectively paid by consumers.[6] The tax base would be the amount of CO2 emitted in each stage of production. In principle, the effect of such a VAT-style CO2 tax would be similar to that of a "classical" (source-based) Pigouvian tax on CO2 emissions levied on polluters: it would reduce carbon emission by increasing the marginal costs of polluting. However, a VAT-style CO2 tax has one important advantage: it would prevent carbon leakage through relocation of production to other countries in case the tax was introduced unilaterally.

Because of the targeted nature of a VAT-style CO2 tax, agents who consume more goods and services requiring more pollution in the production process will face a higher increase in tax payments than others. Indeed, the German Federal Environmental Agency (*Umweltbundesamt*) documents that the consumption of polluting goods and services varies systematically across demographic groups and most prominently across the income

[5]The EU's objective is to cut greenhouse gas emissions by at least 55% until 2030 and to become climate neutral by 2050.

[6]We abstract from tax incidence effects and potential shifting of the burden in our survey experiment.

and age distributions: According to a recent report[7], for the case of income, German households with a monthly disposable income of more than 4,000 EUR (corresponding roughly to the top 10% threshold) are causing twice as much kilogram of CO2 equivalent per year as households with a monthly disposable income of less than 1,000 EUR (roughly the bottom 15% threshold) and almost 50% more than households with a monthly disposable income between 2,000 and 3,000 EUR. Similar differences arise across the age distribution. Although the agency's data and reports are publicly available, existing survey-based evidence suggests that ordinary people are largely unaware of how a CO2 tax would affect different demographic groups.[8]

Another way of generating higher tax revenue to finance climate-change policies is an increase in the marginal income tax for high-income earners. In contrast to a CO2 tax, this instrument is not directly linked to the consumption of goods and services that generate pollution and contribute to climate change. However, as discussed above, high-income households on average consume more CO2-intensive goods and services and, hence, at least in part and indirectly, this tax increase would also hinge more on households that contribute more to climate change.[9]

The third instrument we consider is a tax on the individuals and firms that gain from climate change. This form of taxation is barely discussed in the public domain, arguably because existing narratives propose negative average effects of climate change but neglect the heterogeneity of the effect across sub-populations. In fact, climate change has differential and heterogeneous effects like virtually any other economic shock. In our German setting, for instance, the agricultural, construction, and tourism sectors are expected to benefit from climate change. The construction sector benefits from policy initiatives aiming at the energetic renovation of buildings and shorter disruptions of construction due to cold weather. Agriculture and tourism are also likely to benefit

[7]See "Wirkungen veränderter Einkommen auf den Ressourcenverbrauch," available at https://www.umweltbundesamt.de/publikationen/wirkungen-veraenderter-einkommen-auf-den.

[8]Recent survey evidence suggests that only 14% of a representative sample of Germans unambiguously support the introduction of a CO2 tax. See https://www.welt.de/politik/article196565033/Umfrage-Mehrheit-der-Deutschen-befuerwortet-Einfuehrung-einer-CO2-Steuer.html.

[9]Such a policy was supported in the 2021 elections by the center-left party SPD, the Green party, which are now both part of the governing coalition, as well as the left party *Die Linke*, see https://www.zdf.de/nachrichten/politik/steuern-bundestagswahl-union-gruene-spd-fdp-linke-afd-100.html.

from warmer weather especially in the coastal regions of northern Germany.[10]

Taxing the gainers of climate change is based on a very different rationale to the other forms of taxation. The costs of climate-change policies would not be borne by those who contribute more to CO2 emissions but by those who gain from such emissions. Such a form of taxation scores highly in terms of efficiency, but ordinary people might consider it unfair, because the gainers of climate change largely gain due to luck rather than deliberate choices. By contrast, polluters deliberately choose to take actions that increase the likelihood of climate change.

Moving on to methods that raise revenues without changes to the tax system, we consider traditional public debt, whereby the government issues bonds. Irrespective of whether these bonds are earmarked (e.g., "green bonds"), this form of financing does not levy costs on the current generation but relies on higher taxation of future generations to pay back the additional public debt. Note that the overlap between the polluting agents and those who pay for climate-change policies is minimal under this scheme: on the one hand, if climate-change policies are implemented today using revenues from public debt, future generations by construction will pollute less as policies reduce future occasions to pollute. On the other hand, the current generation—the last one to have contributed substantially to climate change—would not bear the (full) costs of implementing policies that fight it.

Finally, we consider a (semi-)market-based solution—optional or mandated private insurance for individuals and firms exposed to climate-change risk. Rather than raising revenues to finance climate-change policies, this solution would require agents that may face negative outcomes due to climate change, such as a rise in the sea-level, higher chances of natural disasters, etc., to pay a premium and insure themselves against negative states of the world. If governments intervened in the insurance market with soft regulation on premia and conditions, as is common for the case of car insurance in most European countries, for instance, this solution would not be fully market-based. This policy seems to score lowest in terms of fairness, because it does not induce polluters to internalize the negative externalities they produce through their actions but instead requires those who

[10]Recent climate impact research supports this notion, which suggests that the current temperature in Germany is below the economic optimum (Burke et al., 2015).

face negative shocks to pay the costs of polluters' choices.

III Survey, Information Experiment, and Data

To assess consumers' support for alternative financing schemes when unprompted and after obtaining information about how different sub-populations contribute and/or gain from climate change, we designed a customized survey in cooperation with the German survey firm *forsa*.

The survey was conducted online between September 3^{rd} and 9^{th} 2021 by *forsa*. The sample consists of roughly 15,000 randomly selected participants from the *forsa.omninet panel*. Participants of the forsa.omninet panel are recruited offline via phone as a stratified random sample of the German population. Recruitment is based on quota sampling, which ensures that the pool of panel participants is representative of the German population aged 18 and above. Despite the offline recruitment, the survey was conducted online to ensure timely and cost-effective polling and allow presentation of visual stimuli. For those panelists who have no internet access, TV screens are linked to forsa by a set-top-box that allows responding to the survey. To further account for stratification and in order to correct for potential residual selection into online participation by subjects that were originally recruited offline, *forsa* provides survey weights (calibrated to German census data) for the final sample, which we use to test the robustness of our baseline results.

The survey consists of three parts.[11] In the first part, we collect some basic demographics and elicit political views, economic preferences, and attitudes towards climate change. In the second part, we randomly allocate respondents to one of four experimental arms—a control group and three treatment groups. Each of the groups read a short paragraph providing information about climate change in Germany based on the same official governmental-agency report. Below, we paste our own English translation of the paragraphs, which were originally delivered in German:[12]

Group 1 (Control): *According to the Federal Environment Agency, climate change has*

[11] We report all the survey questions and the original version in German in the Online Appendix.
[12] Please find the original formulation and the other experimental materials in the Online Appendix.

far-reaching consequences for Germany. For example, climate change will make extreme weather events such as heat waves or heavy rain more likely in Germany. In addition, tropical diseases can spread more easily in Germany due to rising temperatures.

Group 2 (Pollution by Income): *According to the Federal Environment Agency, climate change has far-reaching consequences for Germany. For example, climate change will make extreme weather events such as heat waves or heavy rain more likely in Germany. In addition, tropical diseases can spread more easily in Germany due to rising temperatures.*

According to the Federal Environment Agency, emissions of climate-damaging CO2 increase with income. This means that high-income households contribute more to climate change than low-income households.

Group 3 (Pollution by Age): *According to the Federal Environment Agency, climate change has far-reaching consequences for Germany. For example, climate change will make extreme weather events such as heat waves or heavy rain more likely in Germany. In addition, tropical diseases can spread more easily in Germany due to rising temperatures.*

According to the Federal Environment Agency, emissions of climate-damaging CO2 increase with age. This means that older generations have contributed more to climate change than younger generations.

Group 4 (Gainers of Climate Change): *According to the Federal Environment Agency, climate change has far-reaching consequences for Germany. For example, climate change will make extreme weather events such as heat waves or heavy rain more likely in Germany. In addition, tropical diseases can spread more easily in Germany due to rising temperatures.*

According to the Federal Environment Agency, climate change poses not only many risks, but offers also opportunities for specific industries and regions. Milder winters, for example, could reduce downtime in the construction industry. In addition, a warmer climate could make the North Sea and Baltic Sea coasts more attractive for the tourism

industry in the coming decades.

After reading one of the texts, all respondents faced the same question to elicit the main outcomes of interest in the paper—subjects' support for each of our proposed financing schemes for climate-change policies:

Climate change imposes costs on the government in a variety of ways, e.g. due to the destruction of infrastructure as a result of extreme weather events or the need to adapt to changing climate conditions. To what extent do you support each of the following proposals to finance the costs of climate change? Please indicate your agreement with each proposal on a scale from 0 (=I do not support at all) to 10 (=I fully support).

1. *The introduction of a CO2 tax on goods and services. The amount of the tax increases with the amount of CO2 emitted during production.*
2. *The increase in income tax for top earners, with high-income households paying higher taxes on their income.*
3. *The introduction of a tax on those who benefit from potential positive effects of climate change.*
4. *No higher taxes today. However, this would mean that the government would have to take on debt to finance the costs, which would have to be paid off by future generations.*
5. *Households should privately insure themselves against the costs and consequences of climate change.*

Table 1 reports summary statistics for our sample. Respondents are equally split between men and women and are on average 53 years old. Nearly half of the sample holds at least a higher secondary degree and 14% reside in Eastern Germany. In terms of employment, 61% have full-time or part-time jobs, whereas 27% are retired. About 44% of respondents estimate that their income is above the median of the German population.

Turning to attitudes towards climate change, most participants believe that climate change is a relevant problem (the average assessed gravity of the problem is 8 out of 10), and about half of the sample reports a high level of trust in climate scientists. As indicated in the last column of table 1, where we report the mean values of the variables we observe for our sample that are also available in the German Socio-Economic Panel (GSOEP) for the aggregate population, our sample is largely representative of the German population as a whole.

Table 1: Summary statistics

	Mean	Std.dev.	Min.	Max.	Population
Female (0/1)	0.48	0.50	0	1	0.51
Age	53.12	15.99	18	98	51.10
Higher secondary degree (0/1)	0.47	0.50	0	1	0.41
Eastern Germany (0/1)	0.14	0.35	0	1	0.17
Employed (0/1)	0.61	0.49	0	1	0.59
Retired (0/1)	0.27	0.44	0	1	0.26
Perceived income above median (0/1)	0.44	0.50	0	1	.
Climate change as problem (0-10)	7.97	2.38	0	10	.
High trust in climate scientists (0/1)	0.49	0.50	0	1	.

Notes: This table reports summary statistics for demographics as well as perceptions of the survey participants. The last column shows the respective values for the German population in 2019, which have been calculated based on data from the German Socio-Economic Panel.

IV Baseline Support for Financing Schemes: Evidence from the Control Group

We firstly focus on subjects in the control group, who were not exposed to any information about the heterogeneity of polluters or gainers from climate change. Studying this group provides us with ordinary consumers' unprompted views about the fairness and viability of the financing schemes we consider. Later, we will move on to assess the effects of providing information about who contributes more to or gains more from climate change on individuals' views and beliefs.

We elicit the support for different financing schemes on a 11-point Likert scale ranging from no support at all (0) to very strong support (10). In Table 2, we report the sample average as well as the shares of control subjects who express high support (≥ 7), low support (≤ 3), or "indifference" (≥ 4 and ≤ 6).

The average control subject favors increases in the top marginal income tax rate with an average score of more than 7. The second most supported policy is a CO2 tax with an average score of 5.6 and an approval rate of 45%, followed by a tax on the gainers of climate change. The average support for private insurance against climate change is only around 4 and only 22% of the control group support this option. Finally, issuing more public debt and hence shifting the burden of financing climate change to future generations is only supported by 13.5% of the control group and the average support is less than 3.5. On average, Germans display a notorious aversion to private and public debt (see, e.g., Hayo and Neumeier, 2017), which motivates our design of an information experiment that compares differences in support for debt across groups of subjects and thus washes away the systematic low support for this type of financing scheme, which is common to all Germans.

We also detect heterogeneous patterns in the extent to which unprompted consumers are able and willing to provide their level of support for different financing schemes. Namely, more than 11% of survey respondents chose the "don't know" answer option when prompted to evaluate the support for taxing the gainers of climate change. The second-highest share of "don't know" answers was only 3.8% for the option of increasing public debt, and this share is minimal for the other schemes. These patterns might reflect the fact that the heterogeneity of the effects of climate change and especially the possibility that certain groups of the population gain rather than lose from climate change are barely discussed in the media and political discourse, so that a non-negligible share of the population, when not provided with a description of who the gainers of climate change are and why, has a hard time assessing who would bear the costs of this scheme.

We move on to assess the pairwise correlations of stated views about different financing methods in Table 3. Unsurprisingly, we find that views about schemes that raise revenues through higher taxation are positively correlated, although the pairwise

Table 2: Support for financing methods within the control group

	Mean	Std. dev.	Low support	Indifferent	High support	No answer
CO2 sales tax	5.60	3.33	26.8%	26.0%	44.9%	2.3%
Increase top tax rate	7.02	3.05	15.3%	18.0%	65.6%	1.1%
Tax on gainers	5.46	3.32	24.5%	27.3%	37.0%	11.2%
Higher debt burden	3.45	2.74	51.7%	31.0%	13.5%	3.8%
Private insurance	4.07	3.01	41.8%	32.6%	22.3%	3.4%

Notes: Mean and std. dev. refer to the mean and standard deviation of the support for the respective financing method measured between 0 and 10. "Low support" ("high support") reports the share of participants which report a value of 3 or below (7 or above). "Indifferent" represents the share of participants reporting a value between 4 and 6. "No answer" lists the share of people who say "don't know".

correlations are always below 0.40. The support for higher public debt, however, is negatively correlated with the support for higher taxes. Instead, views about a private insurance solution are barely correlated with the other forms in our representative sample. The estimated correlation coefficients flip sign across tax-based methods and are economically small—always below 0.10.

Table 3: Correlation coefficients for the financing methods (control group)

	(1)	(2)	(3)	(4)	(5)
(1) Support CO2 sales tax	1.00				
(2) Support increase top marginal tax rate	0.39	1.00			
(3) Support tax on gainers	0.23	0.43	1.00		
(4) Support higher debt burden	-0.30	-0.20	-0.04	1.00	
(5) Support private insurance	0.09	-0.04	0.05	0.10	1.00

Notes: The table reports the correlations across the different financing methods. The support for each financing method measured between 0 ("low support") and 10 ("high support").

We also assess how attitudes relate to voting preferences, since political parties have different views about the desirability of policies to fight climate change and their financing. We elicited subjects' support for the four largest parties that ran in the 2021 German general elections: the *Christliche Demokratische Union* (CDU)—a center-right

conservative party; the *Sozialdemokratische Partei Deutschlands* (SPD)—a center-left labor party; the *Grünen*—a center-left party that puts environmental policies at the top of the agenda; and the *Freiheitliche Demokratische Party* (FDP)—a pro-market party.

We report the average support for each financing scheme within control subjects grouped by political views in Figure 1. The patterns we detect are consistent with the political platforms of each party: the introduction of a CO2 tax, which is part of the Green Party ideological platform, exhibits substantially higher levels of approval among Green-party supporters (panel (a)). Center-right and center-left leaning subjects are similarly supportive of the introduction of this indirect, targeted tax, whereas free-market-leaning subjects are less supportive than others.

The similar support for a CO2 tax by center-left and center-right voters is not due to the fact that the two voter bases have similar views about taxation in general. When it comes to increasing direct taxation on high-income earners, center-left voters are substantially in favor as are supporters of the Green party, whereas center-right and free-market voters display substantial disagreement (panel (b)). The four political groups are strikingly aligned in terms of their (low) support for a tax on the gainers of climate change (panel (c)), which again stresses the fact that center-left leaning subjects are not simply more in favor of raising revenues through higher taxation, but only support this scheme if the burden of higher taxes hinges on a specific group—high-income earners. Support for higher public debt is low among all groups (panel (d)), as is support for private insurance (panel (e)), with Green-party voters being most against raising public debt. Center-right and free-markets voters are slightly more in favor of a market-based solution via private insurance, but these differences are economically small.

Overall, ordinary consumers appear to find higher taxation of high-income earners desirable, even when they are not made aware that top income earners pollute more. Taxing the gainers of climate change, which would be an efficient way to raise revenues to finance climate-change policies, is supported less and faces the highest share of lack of understanding. This could perhaps stem from the fact that existing narratives barely discuss the possibility that certain groups in the population do gain from climate change, leaving individuals unaware of possible gainers of climate change (Andre et al., 2022).

Shifting the tax burden to future generations by raising additional public debt is the least supported financing scheme.[13]

A potential concern with the descriptive results for the control group is that they might be peculiar to the beliefs and views of Germans, which might differ from the views of ordinary individuals in other countries. For this reason, in the next section we analyze the results from our information experiment, which allows us to wash away any systematic average effects of Germans' beliefs on the support for each financing scheme and isolate the causal effect of information on the identity of polluters and/or gainers from climate change on individual-level support for each financing scheme.

V Information About Polluters and Gainers and the Support for Financing Schemes

We move on to assess if and how information about which sub-populations contribute to climate change and who are the gainers from climate change affects consumers' beliefs about alternative schemes to finance climate-change policies. On top of furthering our understanding of consumers' beliefs and fairness views of taxation, this analysis speaks to the design of information campaigns to manage consumers' views about the efficiency and fairness of alternative financing schemes (D'Acunto et al., 2022; Coibion et al., 2022).

We estimate the following set of OLS specifications at the respondent level:

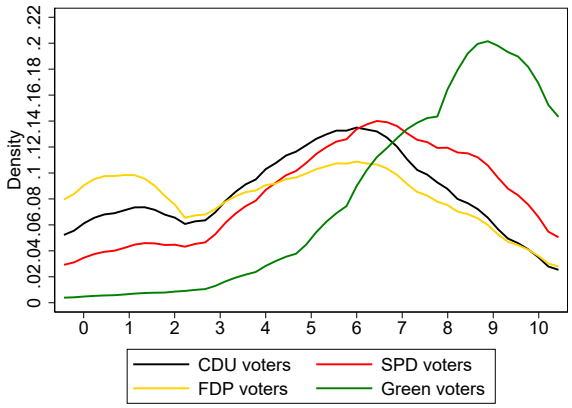
$$Extent\ Support\ Policy_i = \alpha + \beta_1 High\ Income_i + \beta_2 Older\ People_i + \beta_3 Gainers + X_i'\delta + \epsilon_i, \tag{1}$$

where $Extent\ Support\ Policy_i$ is the stated numerical support for each policy, measured between 0 and 10, by subject i; $High\ Income_i$, $Older\ People_i$, and $Gainers_i$ are dummy variables for whether subject i was assigned to the information treatment about high-income households polluting more, about older individuals polluting more, or about

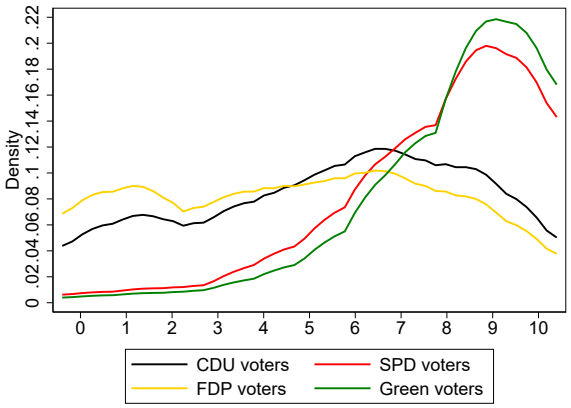
[13] As discussed above, this lack of support for public debt might be driven by Germans' debt aversion and might not arise in other countries and settings. This is one of the motivating arguments for our subsequent experimental analysis that compares the relative support of groups exposed to experimental information relative to the control group, which allows us to wash away any systematic and peculiar aversion to each specific financing scheme by the German population relative to consumers elsewhere.

Figure 1: Support for financing methods by political affiliation

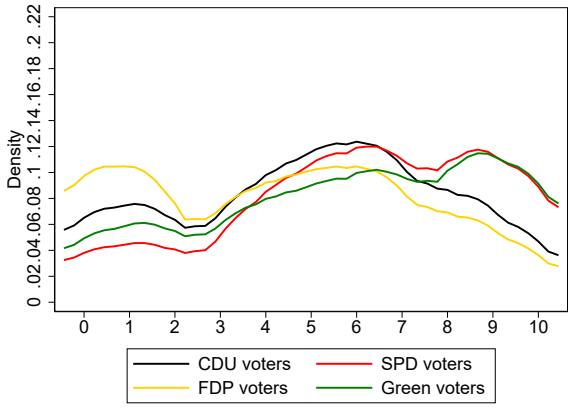
(a) Support for CO2 sales tax



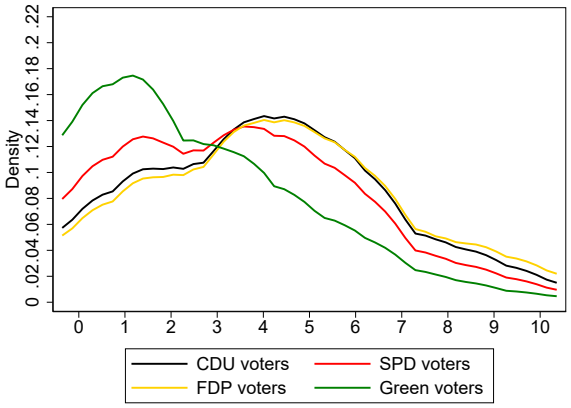
(b) Support for increasing top tax rate



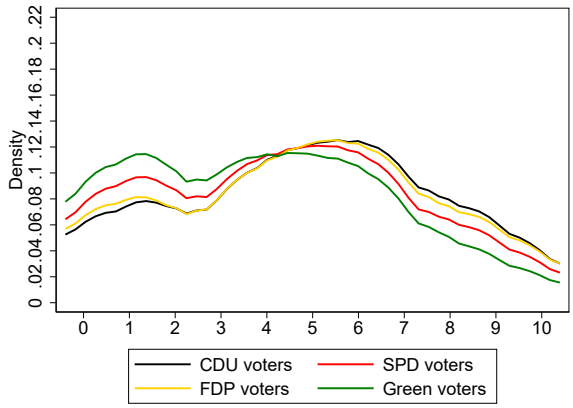
(c) Support for tax on gainers



(d) Support for higher debt burden



(e) Support for private insurance



Notes: The figure plots kernel densities showing the support for the respective financing method by political party preferences. The support for each financing method is measured using an 11-point Likert scale defined between 0 ("low support") and 10 ("high support"). Political preferences were elicited by asking participants which party they will likely vote for in the next federal election at the end of September 2021 (3 weeks after the survey took place). The results show the preferences of subjects supporting the four biggest parties: CDU (a center-right conservative party), SPD (a center-left labor party), the Grünen (a center-left party that puts environmental policies at the top of the agenda) and FDP (a liberal, free-markets party).

certain individuals being gainers of climate change; and X_i' is a vector of individual-level characteristics we elicited within the survey, which include gender, age, education level, employment status, job type and the federal state of residence.[14] Appendix Table A.1 confirms that the randomization of our information treatments was performed appropriately as subjects across all experimental arms are comparable along observable characteristics.

Figure 2 reports in graphical form the treatment effects (estimated coefficients) on the average support for each financing scheme we obtain by estimating equation (1). In each panel, the outcome variable is one of the forms of financing whose support we elicited. As we describe below, the interpretation of these estimated effects is always relative to the support for each financing scheme by subjects in the control condition: a positive treatment effect in an experimental arm means that subjects in that experimental arm support the financing scheme more than subjects in the control group.

A. Information About High-Income Individuals' Contribution to Climate Change

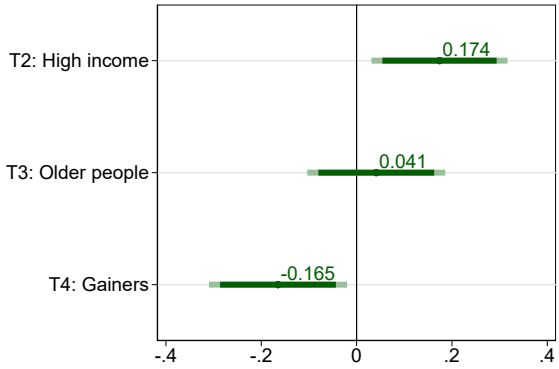
First, we consider subjects who learned that individuals' contribution to carbon emission, based on the goods and services they consume, increases with income (Group 2). Receiving this treatment makes respondents aware that high-income earners bear a greater responsibility for climate change than low-income earners.

Relative to the control group and to the other treatment groups, we find that these subjects are substantially more supportive of a CO2 tax, which, based on the information they receive, they know would be borne to a larger extent by high-income earners. The treatment effect on the support for increasing the marginal tax rate for high-income earners (which is rather high across all groups, irrespective of the information they received) is also positive, although economically small and not statistically significant. These two pieces of evidence do not contradict each other, because increasing the tax rate

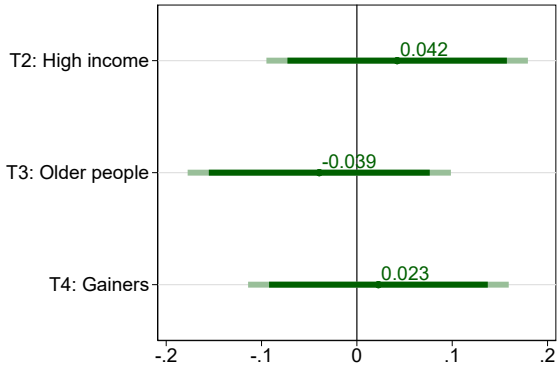
[14] We show in Appendix Figures A.1 to A.3 that results are similar economically and statistically when we employ survey weights, do not use any controls or when we control for a larger set of covariates including preferences.

Figure 2: Information treatment effects

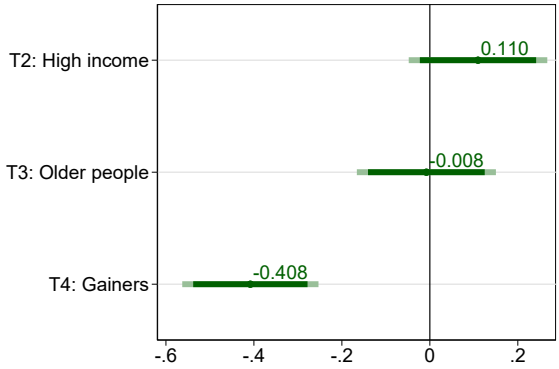
(a) Support for CO2 sales tax



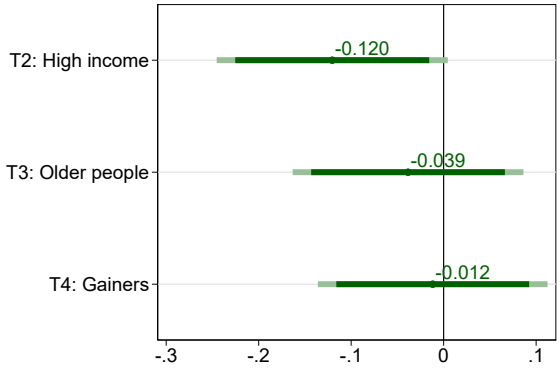
(b) Support for increasing top tax rate



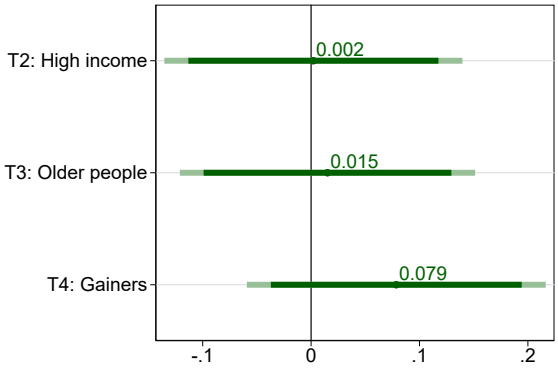
(c) Support for tax on gainers



(d) Support for higher debt burden



(e) Support for private insurance



Notes: The figures show the average change in support for the respective financing method in each treatment group relative to the control group, as described in equation 1. The lines represent the 90% (transparent horizontal lines) and 95% (non-transparent horizontal lines) confidence intervals based on White (1980) robust standard errors. Treatments are described in detail in the text. The set of controls includes gender, age, education level, employment status, job type and the federal state of residence.

on top earners has strong support among all groups, including the control group, as we discussed above. By contrast, the introduction of a CO2 tax, a form of indirect taxation, exhibits substantially lower support in the control group and other experimental arms and opinions about it are more heterogeneous.

Note also that when entering the experiment, most subjects believe (rightly so or mistakenly)[15] that they do not belong to the top income group. Instead, subjects might have a harder time assessing the extent to which they would be affected by a CO2 tax, because they do not know to what extent the production of goods and services they typically purchase contributes to climate change. And, indeed, when we estimate the treatment effect separately for subjects who guessed that their income was below (above) the median, we find that virtually the whole treatment effect is driven by subjects who think they have lower than median income and hence believe they would be less affected than others by a CO2 tax (see Figure A.4 in the Online Appendix).

Overall, informing ordinary consumers that high-income households contribute most to climate change makes a large part of our representative population realize that they would not bear the cost of a CO2 tax more than others and might substantially increase their support for such a tax, presumably increasing its political feasibility.

The conjecture that subjects support a CO2 tax once they realize that they would be barely affected by it is also consistent with another heterogeneity test, in which we study the treatment effect for subjects who stated before receiving the treatment information that climate change is a relevant societal problem. The whole treatment effect of learning about high-income earners' contribution stems from subjects who thought that climate change was not a big problem, and hence who presumably were not highly supportive of costly climate-change policies to begin with, but whose support increases once they learn that others would face the burden of such policies more than them.[16] Consistently, we find that even within the control group, support for a CO2 tax is higher among those who state that climate change is an important problem.

[15] See, e.g., Hvidberg et al. (2021).

[16] See Figure A.5 in the Online Appendix. We find similar results for individuals who have ex-ante low levels of trust in climate scientists and for individuals who state that climate change has no big impact on them personally, see Figures A.6 and A.7 in the Online Appendix.

Figure 2 also shows that subjects who are informed about high-income earners contributing more to climate change are less supportive of financing climate-change policies by issuing public debt. Subjects thus appear to find it more unfair that the current generation does not pay the cost of climate change policies once they learn that, within the current generation, it is higher-income earners who are disproportionately more responsible for pollution.

A tax on the gainers of climate change or a private-insurance solution would not pose a higher burden on high-income earners. Consistently, providing information about the role of high-income earners in polluting has no differential effect on the support for these financing schemes relative to the support control subjects display.

B. Information About the Elderly's Contribution to Climate Change

Our third experimental arm informs subjects that the contribution to climate change increases with age. We find that these subjects' support for the introduction of a CO2 tax is virtually identical, on average, to the support in the control group. That is, once respondents learn that older people would bear a larger part of the cost of a CO2 tax, they do not change their support for this financing method relative to the control group that did not learn this information. This result is intriguing when compared to the findings discussed in the previous subsection. Whereas ordinary consumers support that higher income individuals should pay more to fight climate change when learning that they contribute more to climate change, consumers do not support that older people should pay more when learning that older people similarly contribute more to climate change. This is true despite our survey being based on a representative sample of the German population, and hence a majority of our subjects not being elderly. Note that when we split the sample into two groups by age, we find that both young and old subjects do not change their support for a CO2 tax (see Figure A.8 in the Online Appendix).

These differing views about taxation might originate from the fact that many respondents do not have personal or family connections to high-income households,

whereas, despite not being old, most respondents are likely to have direct relations to at least one older individual. Ordinary consumers might also think that setting tax rates based on demographic characteristics is unfair, even though such characteristics capture agents who contribute more to climate change (Weinzierl, 2011).

Figure 2 further reveals that learning about older individuals contributing more to climate change does not affect subjects' support for financing climate-change policies with public debt, which shifts the fiscal burden of such policies to future generations and hence if anything some might consider less fair than taxing the elderly. So either subjects believe that taxing the elderly is very unfair, or younger subjects might think that whether their older relatives pay higher taxes today or they, who presumably will receive their relatives' bequests, pay higher taxes in the future, is irrelevant.

Figure A.9 in the Online Appendix supports the conjecture that fairness considerations might play an important role for our results. For this heterogeneity test, we exploit a proxy for the extent to which subjects worry about fairness in general. Specifically, we use a question asked in a follow-up survey, whereby respondents had to express the extent to which they found income inequality among workers with the same levels of education fair or unfair.[17] We find that consumers who think that inequality is unfair are more supportive of a CO2 sales tax after learning that high-income individuals contribute more to climate change, but are as supportive as individuals in the control group after receiving information about old individuals' contribution. By contrast, people who are not concerned about inequality are equally supportive of a CO2 tax as individuals in the control group both in the income and in the age-based information treatment.

By eliciting the subjects' views regarding estate taxes, our survey data also allows us to shed light on the relevance of the second non-mutually-exclusive potential channel, whereby younger subjects might think that taxing their future bequests today (by taxing their older relatives) or paying higher taxes in the future has the same impact on their own long-term wealth[18] We find that preferring low estate taxes is correlated with higher support for financing climate change policies by public debt, especially for consumers who

[17]Note that the question about fairness of income inequality was asked in a follow-up survey 2 months after the original survey, with about 8,000 out of the 15,000 participants remaining in the panel.

[18]Note that the question about preferences on estate taxes was also asked in the follow-up survey.

learn that the elderly pollute more. The same group, though, is not more supportive of a CO2 tax relative to the control group (see Figure A.10 and Figure A.11 in the Online Appendix).

Overall, both potential explanations discussed above appear to help explain the result for learning that the elderly pollute more. Those who learn about the larger contribution of the elderly to climate change do not favor higher taxes on the elderly at least in part because of both fairness considerations and because they might expect bequests from the elderly, which would decrease if taxes on the elderly increased.

C. Information About the Gainers of Climate Change

Our third experimental treatment makes subjects learn about the gainers from climate change. Contrary to the intuition based on standard efficiency arguments, which suggests that those who gain from an externality should be taxed to redistribute their gains to those who lose from the externality, subjects who learn that some individuals gain from climate change are substantially *less* supportive of a tax on gainers, relative to both the control group and other treatment groups. They are also significantly less supportive of a CO2 tax, which might indicate that learning about the potential benefits of climate change on a part of the population reduces the average support for fighting climate change.[19] Subjects in this group are not more or less likely to support the other financing methods we consider relatively to the control group.

The effects of providing information about the existence of gainers and losers are striking, because ordinary people's views are at odds with standard economic theory. The other two information treatments we consider let subjects learn about which groups, through their actions, deliberately contribute more to climate change. In the case of gainers and losers, instead, subjects understand that individuals who gain from climate change do so not because of conscious choices or actions, but mostly due to luck. For instance, due to the fact that the geographic locations in which they reside will benefit

[19]In line with this conjecture, we find that the lower support for a CO2 tax is concentrated in the subsample of subjects who perceive climate change as a big problem before the information treatment (see Figure A.5 in the Online Appendix), that is, subjects who are concerned about climate change and are highly supportive of a CO2 tax in general.

from a warmer climate. In this sense, informed subjects' lack of support towards a tax on gainers from climate-change might be driven by their tendency to dislike the taxation of earnings obtained by luck (see, e.g., Weinzierl, 2017; Birney et al., 2006).

Note that the possibility that this result is driven by subjects realizing that they themselves might be taxed as gainers from climate change is minimal, because the populations that gain from climate change include groups that are quite small in terms of geography and economic activities: the vast majority of subjects are unlikely to think that they would face such a tax. We can also assess this possibility directly in our setting, because the examples of individuals who might gain from climate change in our information treatment include those working in tourism in northern Germany. We find that the effect of learning about gainers on supporting a tax on gainers is economically and statistically indistinguishable between subjects who reside in northern Germany and other subjects (see Figure A.12 in the Online Appendix).

VI Conclusions

We use a large-scale information-treatment experiment to assess a representative population's views about alternative schemes to finance climate-change policies. Moreover, we test for the effect of providing ordinary people with different pieces of information about those who contribute to climate change on their support for alternative financing methods.

Learning about high-income earners' contribution to climate change increases ordinary consumers' support for a CO2 tax, which would affect high-income earners disproportionally more than others. This effect is largely driven by an update in the beliefs of low-income earners and especially those who thought that climate change is not a big problem, and hence were not supporting the financing of climate change policies in the first place. These results suggest that providing information about the contribution of each income group to climate change and hence the heterogeneous incidence of the introduction of a CO2 tax might on average increase the political feasibility of this measure (at the expense of the richer part of the population).

By contrast, learning that older individuals also contribute more to climate change does not affect support for a CO2 tax, which would affect older people disproportionally more than others. This reaction is similar for both young and old respondents and is stronger for subjects who care more for fairness, which suggests that taxing the elderly by more might be considered unfair, even though the elderly contribute more to climate change.

Another intriguing result is that, after learning that certain sub-populations gain rather than lose from climate change, subjects are substantially less supportive of taxes levied on the gainers. This result is not driven by subjects' fear of being affected by this tax, because even subjects who do not belong to groups who could gain from climate change dislike this financing method more than others after learning who the gainers are. Ordinary consumers seem to think that a tax on individuals that happen to gain from climate change due to luck would be unfair even though this tax would be efficient from an economic perspective.

Our results inform the political feasibility of alternative (non-exclusive) financing methods to implement climate-change policies, which are becoming ubiquitous around the world. At a broader level, the results emphasize how economic efficiency and perceived fairness often clash in the views of ordinary people, and that communication and information about various aspects of climate change can influence ordinary people's support and views about alternative policies and thus their political feasibility.

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Online Appendix:

How to Finance Climate Change Policies? Evidence from Consumers' Beliefs

Online-Appendix A: Survey and Treatments

Survey in German (original version)

C1: Wie groß sind Ihrer Meinung nach die folgenden Probleme für Deutschland? Bitte geben Sie ihre Einschätzung anhand einer Skala von 0 (=gar kein Problem) bis 10 (= sehr großes Problem) an.

1. Klimawandel
2. Staatsverschuldung
3. Einkommens- und Vermögensungleichheit
4. Geringe Bildungschancen für sozial Benachteiligte
5. Nachhaltigkeit des Rentensystems
6. Die Folgen der Corona-Pandemie
7. Bezahlbarer Wohnraum

[Slider: 0 (Gar kein Problem) - 10 (Sehr großes Problem)]

C2: Laut wissenschaftlichen Studien sind die Temperaturen in Deutschland im Vergleich zur vorindustriellen Zeit durchschnittlich um 1,6 Grad Celsius gestiegen. Inwieweit stimmen Sie jede der folgenden Aussagen zu? Bitte geben Sie Ihre Einschätzung anhand einer Skala von 0 (=stimme überhaupt nicht zu) bis 10 (= stimme voll und ganz zu) an.

1. Der Anstieg der Temperaturen über die letzten Jahrzehnte ist natürlichen Ursprungs und nicht vom Mensch verursacht.
2. Deutschland trägt eine besondere Verantwortung für den Klimawandel.
3. Andere Industriestaaten (ohne Deutschland) tragen eine größere Verantwortung für den Klimawandel als Deutschland.
4. Entwicklungsländer tragen eine besondere Verantwortung für den Klimawandel.
5. Der Klimawandel spielt eine große Rolle bei Extremwettereignissen, wie beispielweise der Flutkatastrophe in Nordrhein-Westfalen und Rheinland-Pfalz im Juli.

[Slider: 0 (Stimme überhaupt nicht zu) - 10 (Stimme voll und ganz zu)]

C3: Inwieweit stimmen Sie jeder der folgenden Aussagen zu? Bitte geben Sie ihre Einschätzung anhand einer Skala von 0 (=stimme überhaupt nicht zu) bis 10 (= stimme voll und ganz zu) an:

1. Der Klimawandel wird weltweit gravierende Folgen haben.
2. Der Klimawandel wird in Europa gravierende Folgen haben.
3. Der Klimawandel wird in Deutschland gravierende Folgen haben.
4. Der Klimawandel wird in meinem Landkreis/ in meiner Stadt gravierende Folgen haben.
5. Der Klimawandel wird für mich persönlich gravierende Folgen haben.
6. Der Klimawandel wird für die nächsten Generationen gravierende Folgen haben.

[Slider: 0 (Stimme überhaupt nicht zu) - 10 (Stimme voll und ganz zu)]

Info Treatment

Programmierung: Bitte die Befragten zufällig in 4 (gleich große) Gruppen einteilen. Jede dieser Gruppen bekommt eine andere der 4 folgenden Informationen, bevor es mit den Fragen weitergeht. Außerdem soll die entsprechende Information mindestens für 30 Sekunden auf dem Bildschirm zu sehen sein.

Treatment Gruppe 1: Der Klimawandel hat laut Umweltbundesamt weitreichende Folgen für Deutschland. Beispielweise werden durch den Klimawandel Extremwetterereignisse wie Hitzewellen oder Starkregen in Deutschland wahrscheinlicher. Außerdem können sich Tropenkrankheiten in Deutschland aufgrund der steigenden Temperaturen leichter ausbreiten.

Treatment Gruppe 2: Der Klimawandel hat laut Umweltbundesamt weitreichende Folgen für Deutschland. Beispielweise werden durch den Klimawandel Extremwetterereignisse wie Hitzewellen oder Starkregen in Deutschland wahrscheinlicher. Außerdem können sich Tropenkrankheiten in Deutschland aufgrund der steigenden Temperaturen leichter ausbreiten.

Laut Umweltbundesamt nimmt der Ausstoß von klimaschädlichem CO2 mit dem Einkommen zu. Das bedeutet, dass einkommensstarke Haushalte stärker zum

Klimawandel beitragen als einkommensschwache Haushalte.

Treatment Gruppe 3: Der Klimawandel hat laut Umweltbundesamt weitreichende Folgen für Deutschland. Beispielweise werden durch den Klimawandel Extremwetterereignisse wie Hitzewellen oder Starkregen in Deutschland wahrscheinlicher. Außerdem können sich Tropenkrankheiten in Deutschland aufgrund der steigenden Temperaturen leichter ausbreiten.

Laut Umweltbundesamt nimmt der Ausstoß von klimaschädlichem CO2 mit dem Alter zu. Das bedeutet, dass die älteren Generationen stärker zum Klimawandel beigetragen haben als die jüngeren Generationen.

Treatment Gruppe 4: Der Klimawandel hat laut Umweltbundesamt weitreichende Folgen für Deutschland. Beispielweise werden durch den Klimawandel Extremwetterereignisse wie Hitzewellen oder Starkregen in Deutschland wahrscheinlicher. Außerdem können sich Tropenkrankheiten in Deutschland aufgrund der steigenden Temperaturen leichter ausbreiten.

Laut Umweltbundesamt bietet der Klimawandel neben vielen Risiken aber auch Chancen für einzelne Bereiche und Regionen. Mildere Winter könnten zum Beispiel die Ausfallzeiten in der Bauwirtschaft reduzieren. Zudem könnte ein wärmeres Klima die Nord- und Ostseeküste in den nächsten Jahrzehnten für die Tourismusbranche attraktiver machen.

D1: Waren Ihnen diese Informationen bekannt?

- Ja
- Nein
- Weiß nicht / keine Angabe

D2: Der Klimawandel verursacht auf vielfältige Weise Kosten für den Staat, z.B. durch die Zerstörung von Infrastruktur in Folge von Extremwetterereignissen oder durch die notwendige Anpassung an die veränderten Klimabedingungen. Inwieweit unterstützen Sie jeden der folgenden Vorschläge, um die Kosten des Klimawandels zu finanzieren? Bitte geben Sie Ihre Zustimmung für den jeweiligen Vorschlag auf einer Skala von 0 (=unterstütze ich überhaupt nicht) bis 10 (= unterstütze ich voll und ganz) an.

1. Die Einführung einer CO2 Steuer auf Güter und Dienstleistungen. Die Höhe der Steuer nimmt dabei mit der Menge an CO2 zu, die bei der Herstellung ausgestoßen

wird.

2. Die Erhöhung der Einkommenssteuer für Spitzenverdiener, bei der einkommensstarke Haushalte höhere Steuern auf Ihr Einkommen zahlen.
3. Die Einführung einer Steuer für diejenigen, die von möglichen positiven Auswirkungen des Klimawandels profitieren.
4. Keine höheren Steuern heute. Das würde allerdings bedeuten, dass der Staat zur Finanzierung der Kosten Schulden aufnehmen muss, die von den zukünftigen Generationen abgezahlt werden müssen.
5. Haushalte sollen sich privat gegen die Kosten und Folgen des Klimawandels absichern.

[Slider: 0 (Unterstütze ich überhaupt nicht) - 10 (Unterstütze ich voll und ganz)]

Survey in English (translated version)

C1: How big do you think the following problems are for Germany? Please indicate your assessment using a scale from 0 (= no problem at all) to 10 (= very big problem).

1. Climate change
2. Public debt
3. Income and wealth inequality
4. Low educational opportunities for the socially disadvantaged
5. Sustainability of the pension system
6. The consequences of the Corona pandemic
7. Affordable housing

[Slider: 0 (Not problem at all) - 10 (Very big problem)]

C2: According to scientific studies, temperatures in Germany have risen by an average of 1.6 degrees Celsius compared to pre-industrial times. To what extent do you agree with each of the following statements? Please indicate your assessment using a scale from 0 (=do not agree at all) to 10 (= fully agree).

1. The rise in temperatures over the last decades is of natural origin and not caused by humans.
2. Germany bears a special responsibility for climate change.
3. Other industrialised countries (excluding Germany) bear a greater responsibility for climate change than Germany.
4. Developing countries bear a special responsibility for climate change.
5. Climate change plays a major role in extreme weather events, such as the flood disaster in North Rhine-Westphalia and Rhineland-Palatinate in July.

[Slider: 0 (Strongly disagree) - 10 (Strongly agree)]

C3: To what extent do you agree with each of the following statements? Please indicate your assessment using a scale from 0 (=do not agree at all) to 10 (= fully agree):

1. Climate change will have serious consequences worldwide.
2. Climate change will have serious consequences in Europe.
3. Climate change will have serious consequences in Germany.
4. Climate change will have serious consequences in my district/city.
5. Climate change will have serious consequences for me personally.
6. Climate change will have serious consequences for the next generations.

[Slider: 0 (Strongly disagree) - 10 (Strongly agree)]

Info Treatment

Programming: Please divide the respondents randomly into 4 (equally sized) groups. Each of these groups will be given one of the 4 following pieces of information before continuing with the questions. In addition, the corresponding information should be on the screen for at least 30 seconds.

Group 1: According to the Federal Environment Agency, climate change has far-reaching consequences for Germany. For example, climate change will make extreme weather events such as heat waves or heavy rain more likely in Germany. In addition, tropical diseases can spread more easily in Germany due to rising temperatures.

Group 2: According to the Federal Environment Agency, climate change has far-reaching consequences for Germany. For example, climate change will make extreme weather events such as heat waves or heavy rain more likely in Germany. In addition, tropical diseases can spread more easily in Germany due to rising temperatures.

According to the Federal Environment Agency, emissions of climate-damaging CO2 increase with income. This means that high-income households contribute more to climate change than low-income households.

Group 3: According to the Federal Environment Agency, climate change has far-reaching consequences for Germany. For example, climate change will make extreme weather events such as heat waves or heavy rain more likely in Germany. In addition, tropical diseases can spread more easily in Germany due to rising temperatures.

According to the Federal Environment Agency, emissions of climate-damaging CO2 increase with age. This means that older generations have contributed more to climate change than younger generations.

Group 4: According to the Federal Environment Agency, climate change has far-reaching consequences for Germany. For example, climate change will make extreme weather events such as heat waves or heavy rain more likely in Germany. In addition, tropical diseases can spread more easily in Germany due to rising temperatures.

According to the Federal Environment Agency, climate change poses not only many risks, but offers also opportunities for individual areas and regions. Milder winters, for example, could reduce downtime in the construction industry. In addition, a warmer climate could make the North Sea and Baltic Sea coasts more attractive for the tourism industry in the coming decades.

D1: Were you aware of this information?

- Yes
- No
- Don't know / no answer

D2: Climate change imposes costs on the government in a variety of ways, e.g. due to the destruction of infrastructure as a result of extreme weather events or the need to adapt to changing climate conditions. To what extent do you support each of the following proposals to finance the costs of climate change? Please indicate your agreement with each proposal on a scale from 0 (=I do not support at all) to 10 (=I fully support).

1. The introduction of a CO2 tax on goods and services. The amount of the tax increases with the amount of CO2 emitted during production.
2. The increase in income tax for top earners, with high-income households paying higher taxes on their income.
3. The introduction of a tax on those who benefit from potential positive effects of climate change.
4. No higher taxes today. However, this would mean that the government would have to take on debt to finance the costs, which would have to be paid off by future generations.
5. Households should privately insure themselves against the costs and consequences of climate change.

[Slider: 0 (I do not support at all) - 10 (I fully support)]

Online-Appendix B: Additional Figures and Tables

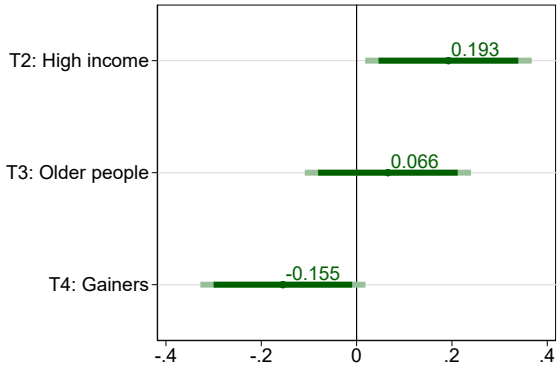
Table A.1: Balancedness across treatment groups

	Treatments			
	T1: Control	T2: High income	T3: Older age	T4: Gainers
Female share	0.47	0.49	0.47	0.49
	(0.50)	(0.50)	(0.50)	(0.50)
Age	53.04	52.93	52.90	53.61
	(15.90)	(15.99)	(16.10)	(15.97)
Higher secondary degree	0.47	0.49	0.47	0.47
	(0.50)	(0.50)	(0.50)	(0.50)
Eastern Germany share	0.14	0.14	0.13	0.14
	(0.34)	(0.35)	(0.34)	(0.35)
Employed share	0.61	0.61	0.61	0.60
	(0.49)	(0.49)	(0.49)	(0.49)
Retired share	0.26	0.26	0.26	0.28
	(0.44)	(0.44)	(0.44)	(0.45)

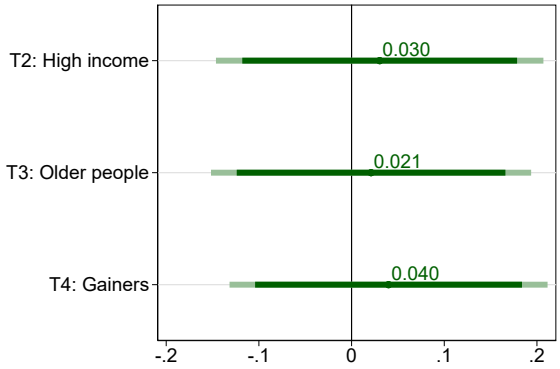
Notes: The table reports means and standard deviations (in parentheses) for different observable characteristics of respondents in each treatment group. The first row of the table indicates treatment arms for which moments are reported.

Figure A.1: Information treatment effects (weighted regressions)

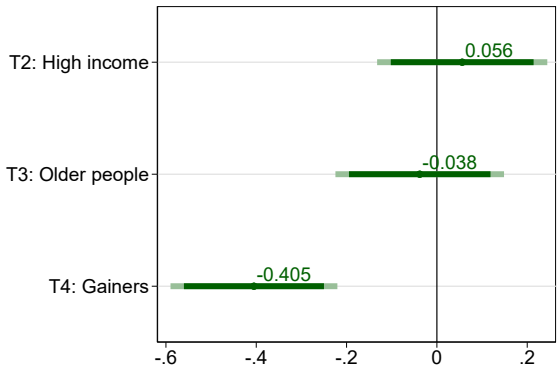
(a) Support for CO2 sales tax



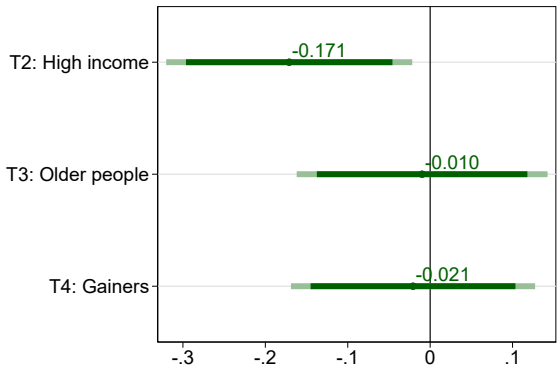
(b) Support for increasing top tax rate



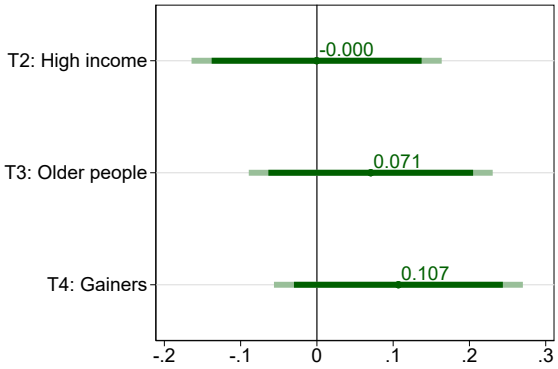
(c) Support for tax on gainers



(d) Support for higher debt burden



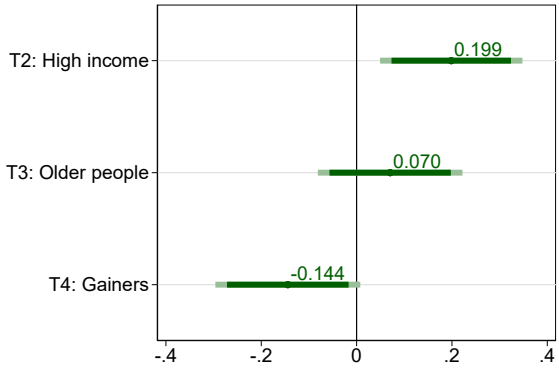
(e) Support for private insurance



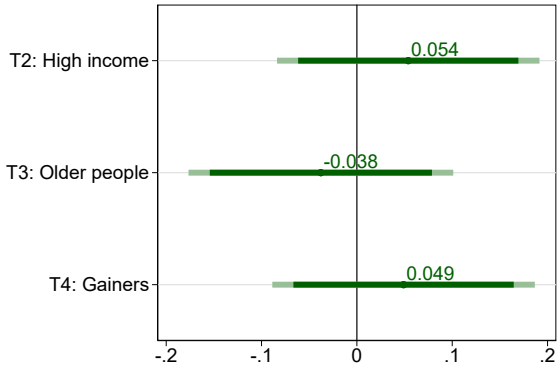
Notes: The figures show the average change in support for the respective financing method in each treatment group relative to the control group, as described in equation 1. Regressions use sampling weights. The lines represent the 90% (transparent horizontal lines) and 95% (non-transparent horizontal lines) confidence intervals. Treatments are described in detail in the text. The set of controls includes gender, age, education level, employment status, job type and the federal state of residence. White (1980) robust standard errors are used.

Figure A.2: Information treatment effects (no controls)

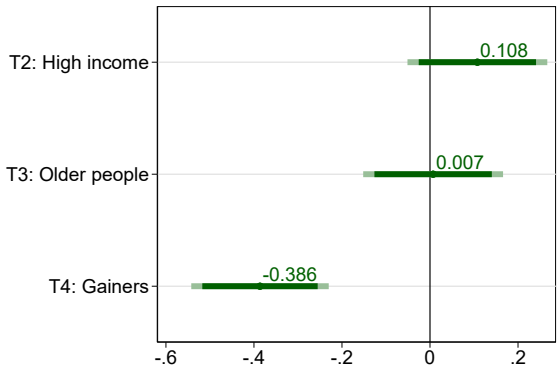
(a) Support for CO2 sales tax



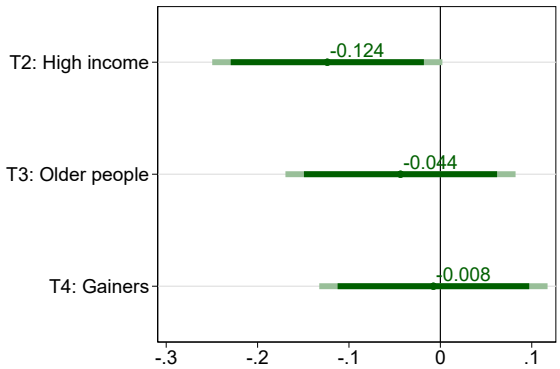
(b) Support for increasing top tax rate



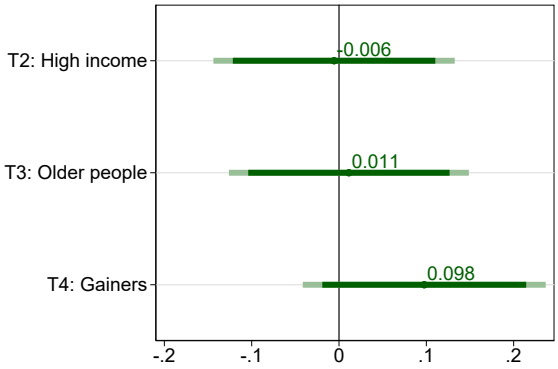
(c) Support for tax on gainers



(d) Support for higher debt burden



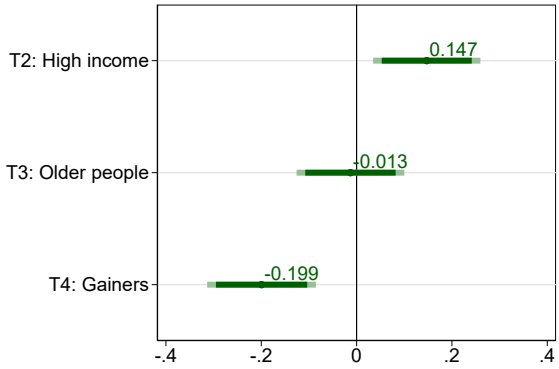
(e) Support for private insurance



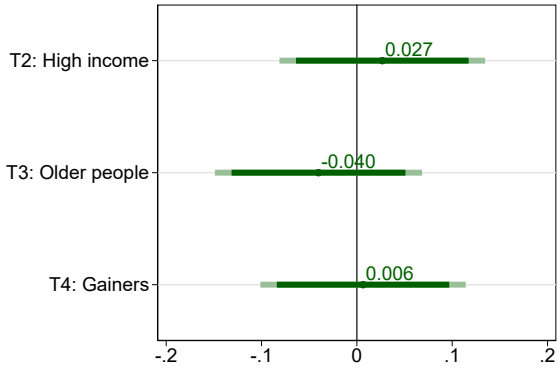
Notes: The figures show the average change in support for the respective financing method in each treatment group relative to the control group, as described in equation 1. The lines represent the 90% (transparent horizontal lines) and 95% (non-transparent horizontal lines) confidence intervals. Treatments are described in detail in the text. No controls are included. White (1980) robust standard errors are used.

Figure A.3: Information treatment effects (larger set of controls)

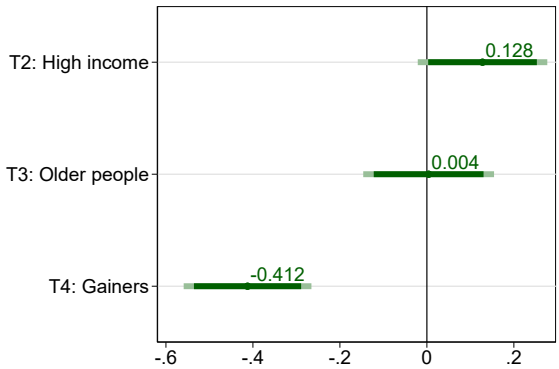
(a) Support for CO2 sales tax



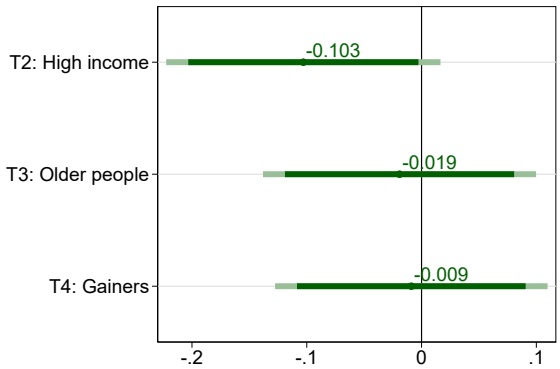
(b) Support for increasing top tax rate



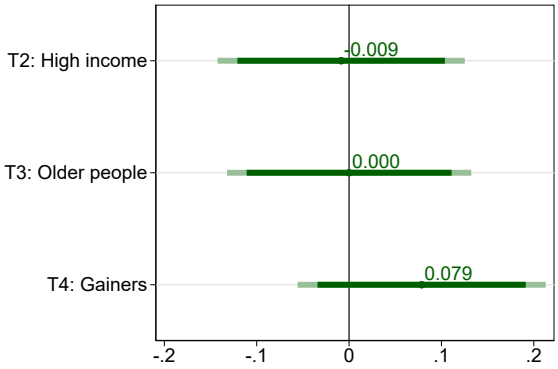
(c) Support for tax on gainers



(d) Support for higher debt burden

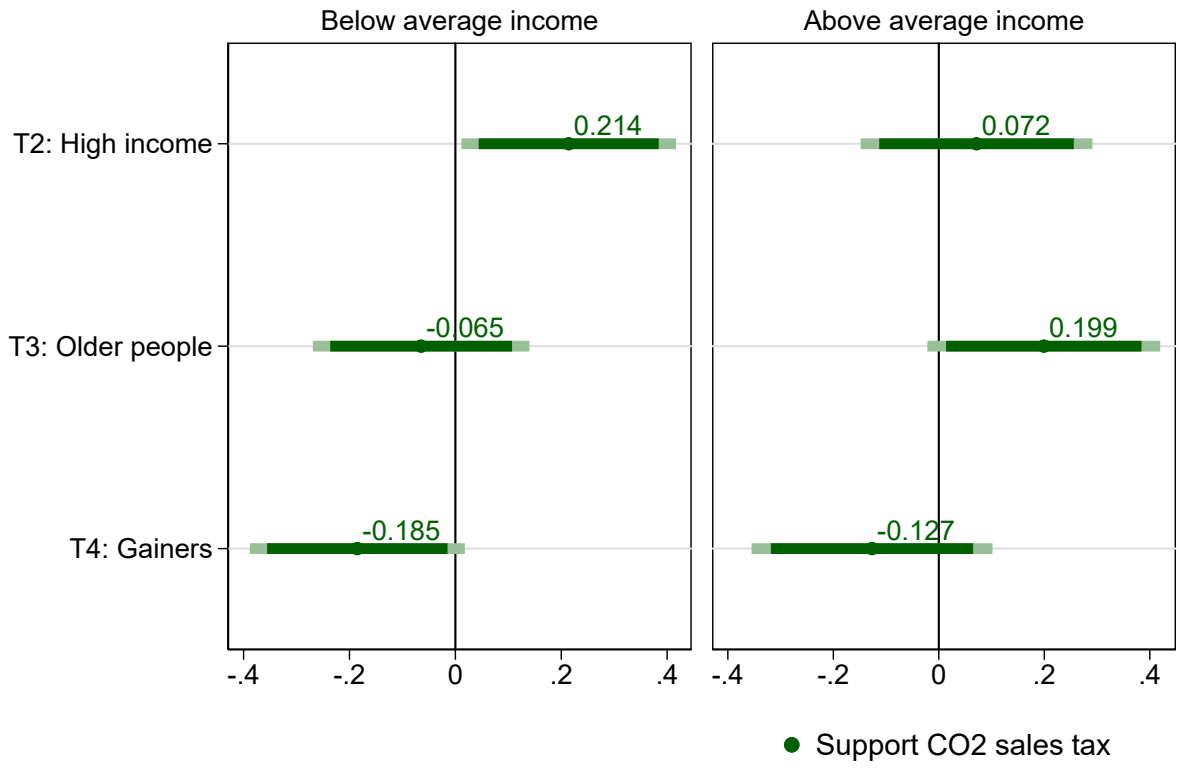


(e) Support for private insurance



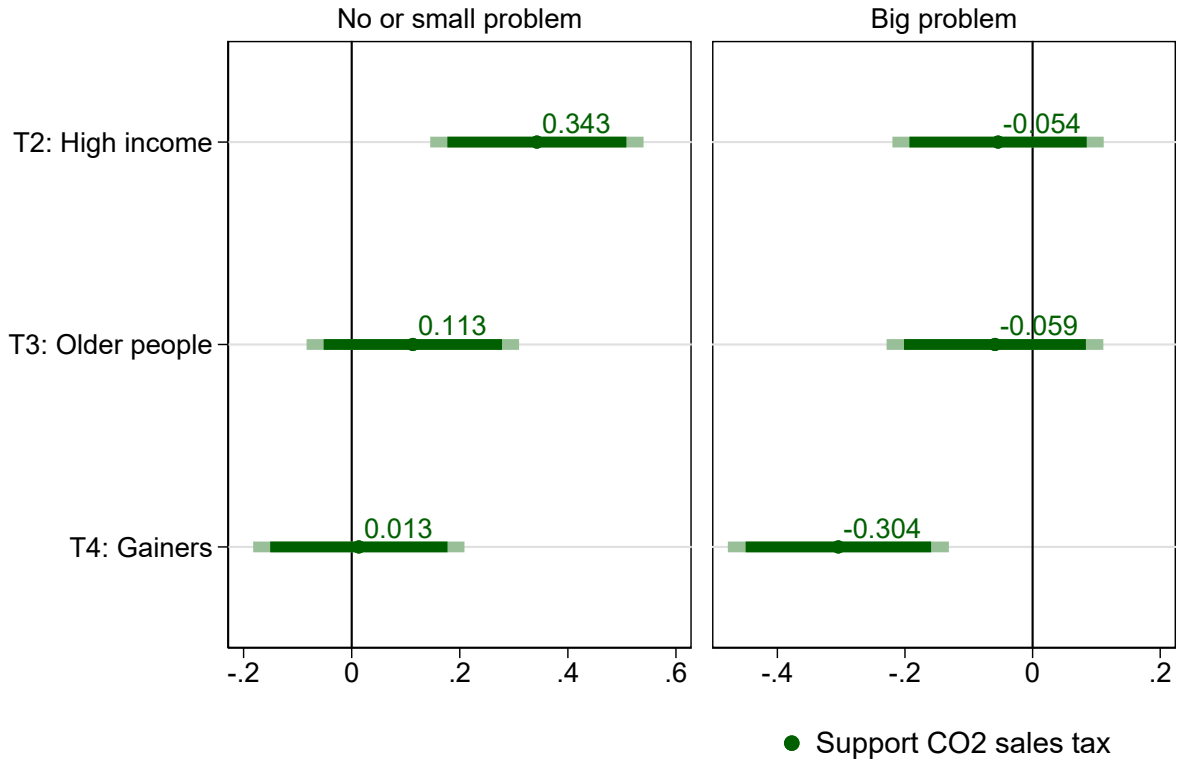
Notes: The figures show the average change in support for the respective financing method in each treatment group relative to the control group, as described in equation 1. Regressions use sampling weights. The lines represent the 90% (transparent horizontal lines) and 95% (non-transparent horizontal lines) confidence intervals. Treatments are described in detail in the text. The set of controls includes gender, age, education level, employment status, job type, the federal state of residence, party preferences, dummy for owning a car, interest in politics, attitudes towards public debt and inequality, opinion on whether climate change is of natural origin, opinion on role of climate change in extreme weather disasters and estimated impact of climate change on Germany. White (1980) robust standard errors are used.

Figure A.4: Support for CO2 sales tax: Heterogeneity by estimated income position



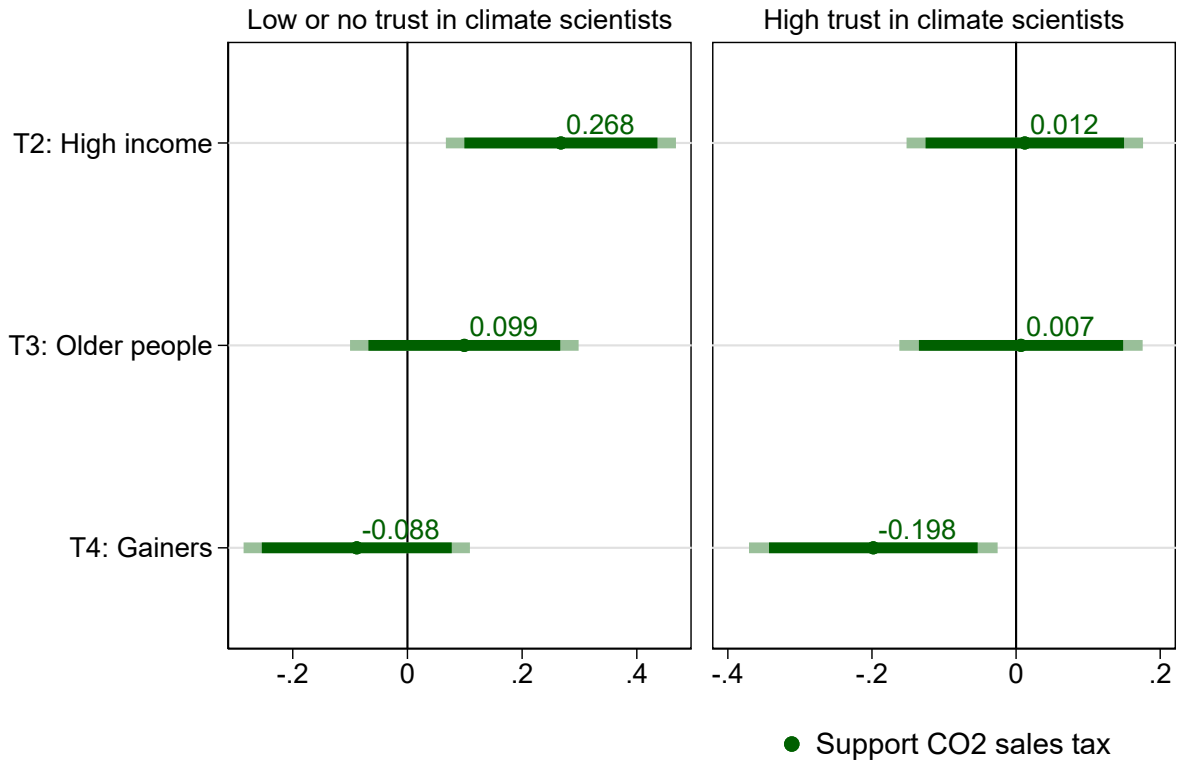
Notes: The figures show treatment effects by heterogeneity in the perceived income position. The lines represent the 90% (transparent horizontal lines) and 95% (non-transparent horizontal lines) confidence intervals. The perceived income position is measured based on indidivuals' answers to the question: "In your opinion, out of 100 randomly selected people in Germany, how many have a higher income than you?". "Below average income" refers to participants that -according to their estimates- belong to the bottom 50% of the income distribution. "Above average income" refers to participants that belong to the upper half of the income distribition.

Figure A.5: Support for CO2 sales tax: Heterogeneity by whether climate change is a big problem or not



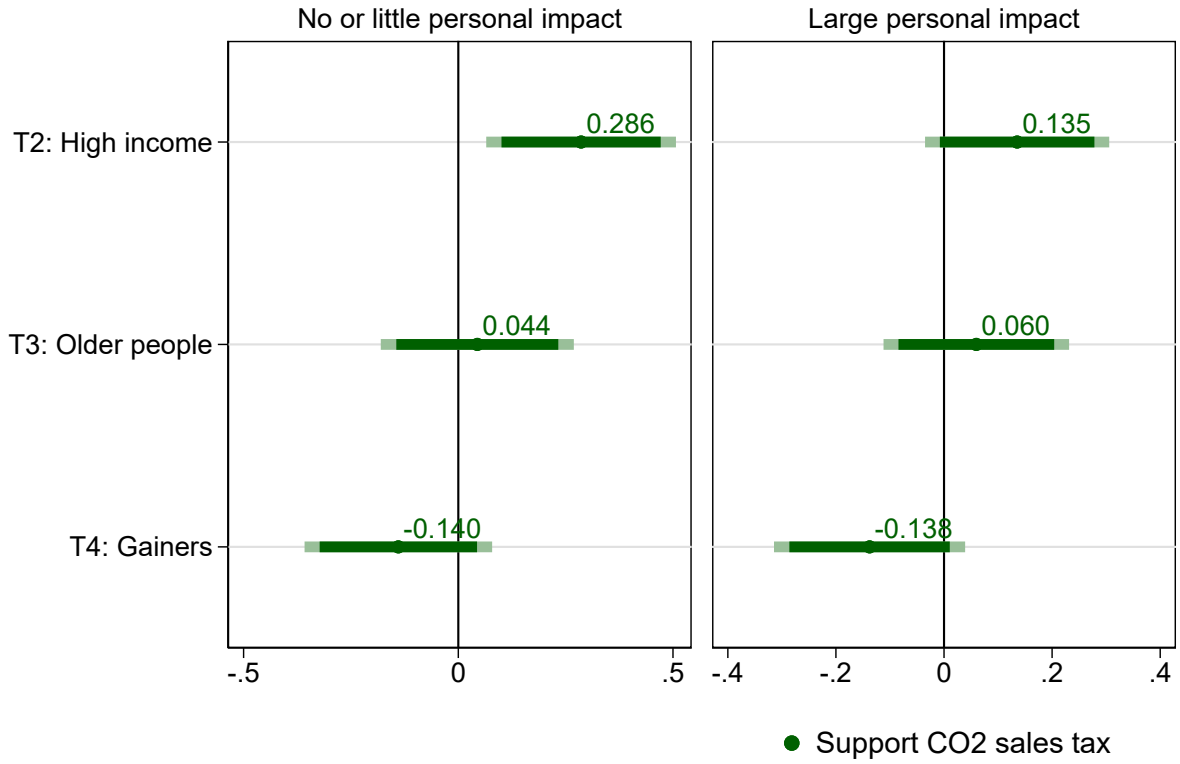
Notes: The figures show treatment effects by heterogeneity in the perceived importance of climate change as a problem. The lines represent the 90% (transparent horizontal lines) and 95% (non-transparent horizontal lines) confidence intervals. The perceived importance of the problem is measured based on individuals' answers to the question: "How large is the problem of climate change in your opinion?". "No or small problem" refers to participants that said that climate change is a problem of 8 or lower on the slider defined between 0 and 10 (with 0 meaning no problem at all and 10 meaning very large problem). "Big problem" refers to participants saying that climate change is problem of 9 or higher on the same slider.

Figure A.6: Support for CO2 sales tax: Heterogeneity by degree of trust in climate scientists



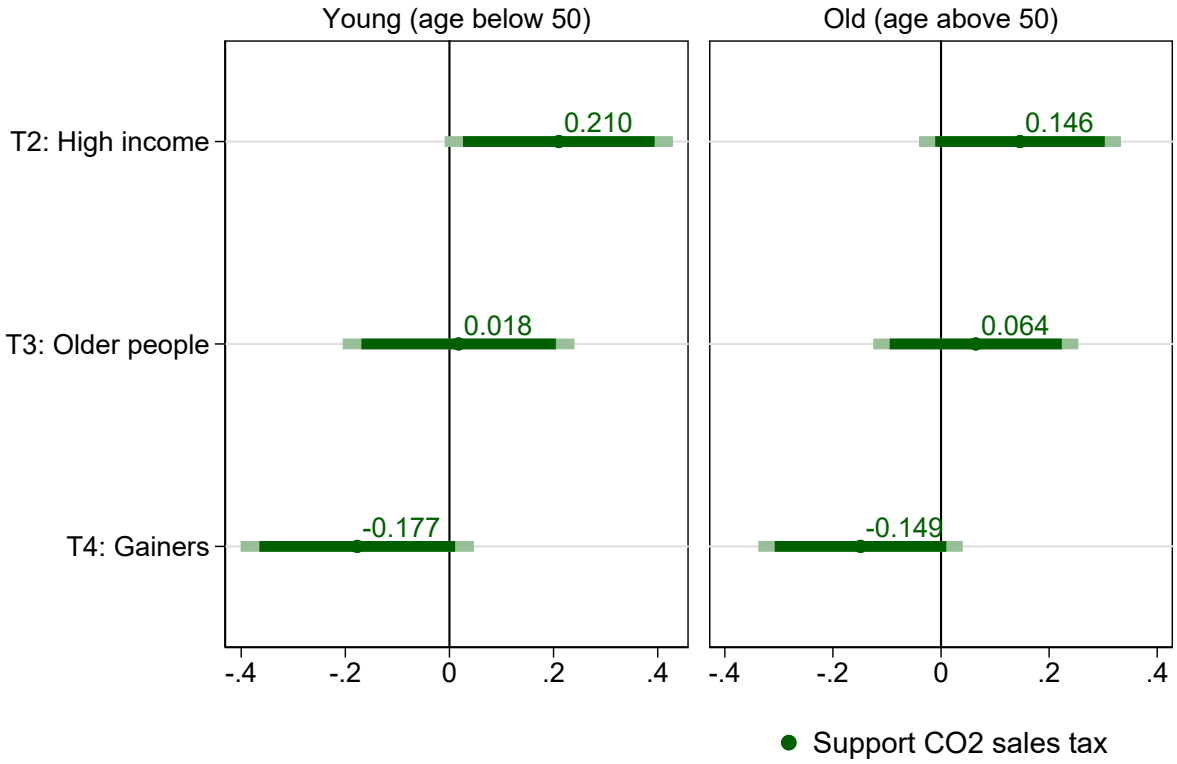
Notes: The figures show treatment effects by heterogeneity in the degree of trust in climate scientists. The lines represent the 90% (transparent horizontal lines) and 95% (non-transparent horizontal lines) confidence intervals. The degree of trust into climate scientists is measured based on indidivuals' answers to the question: "How much trust do you have in climate scientists?". "Low or no trust in scientists" refers to participants that stated that they have no or little trust in climate scientists, while "High trust in scientists" refers to participants that stated that they have high or very high trust in climate scientists.

Figure A.7: Support for CO2 sales tax: Heterogeneity by whether climate change will have personal impact or not



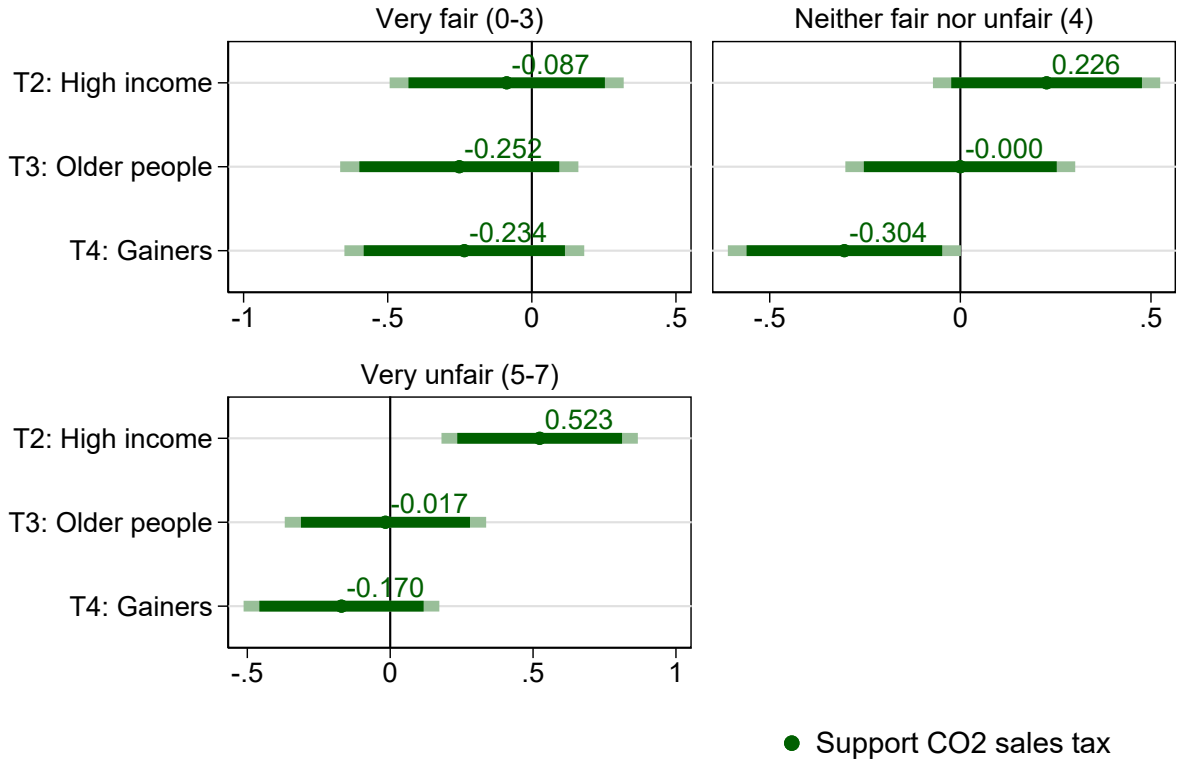
Notes: The figures show treatment effects by heterogeneity in the perceived impact of climate change on themselves. The lines represent the 90% (transparent horizontal lines) and 95% (non-transparent horizontal lines) confidence intervals. The degree of personal impact is measured based on indidivuals' answers to the statement: "climate change will have serious consequences for me personally". "No or little personal impact" refers to participants that stated a 5 or lower on the slider defined between 0 and 10 (with 0 meaning not agreeing at all to the statement and 10 meaning full agreement). "Large personal impact" refers to participants that stated a 6 or higher on the same slider.

Figure A.8: Support for CO2 sales tax: Heterogeneity by age of participants



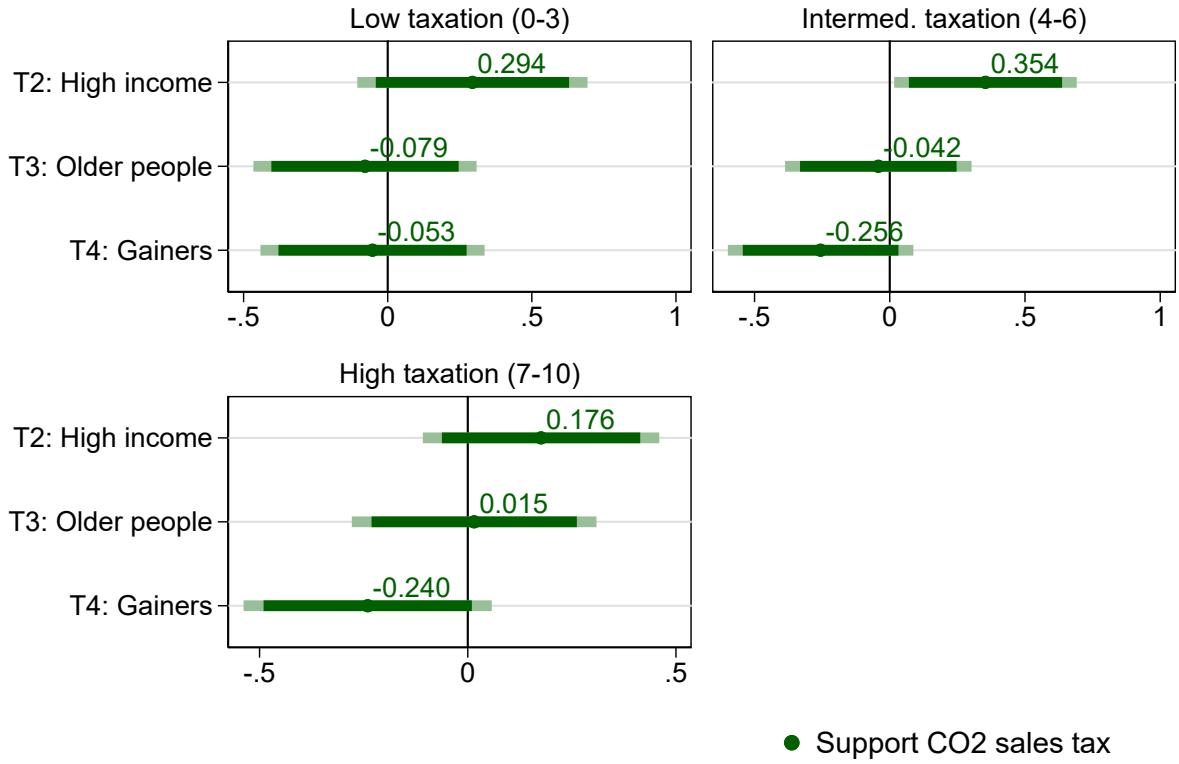
Notes: The figures show treatment effects by heterogeneity in age of participants. The lines represent the 90% (transparent horizontal lines) and 95% (non-transparent horizontal lines) confidence intervals. "Young" refers to individuals aged below 55. "Old" refers to individuals with an age of 55 or higher.

Figure A.9: Support for CO2 sales tax: Heterogeneity by fairness perceptions of inequality with the same educational background



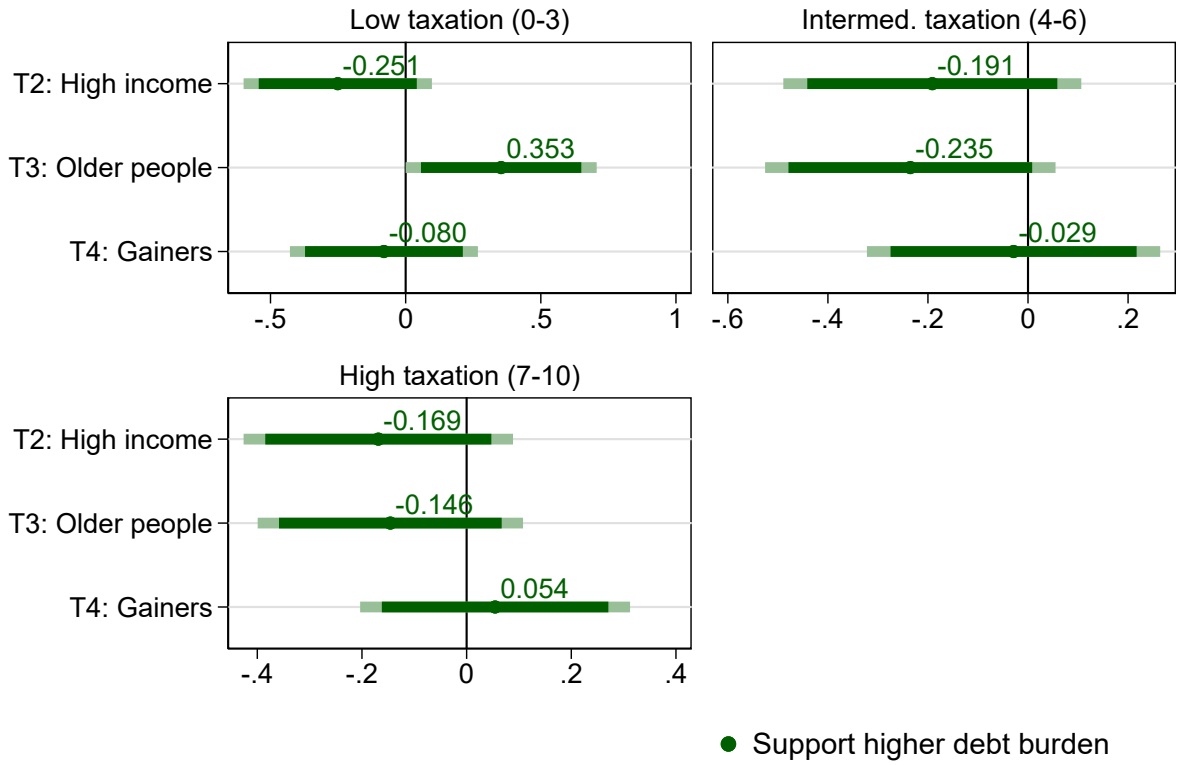
Notes: The figures show treatment effects by heterogeneity in fairness perceptions of inequality with the same educational background. The lines represent the 90% (transparent horizontal lines) and 95% (non-transparent horizontal lines) confidence intervals. The perceived fairness is measured based on individuals' answers to the question: "To what extent do you think it is fair or unfair that there are income differences between people with the same level of education?". "Very fair" refers to participants stating a number between 0 and 3 on a scale defined between 0 and 7 (with 0 meaning very fair, 4 meaning neither fair nor unfair and 7 meaning very unfair). "Neither fair nor unfair" refers to participants stating a 4 and "very unfair" refers to participants stating a number between 5 and 7 on the same scale.

Figure A.10: Support for CO2 sales tax: Heterogeneity by tax preferences on inheritances



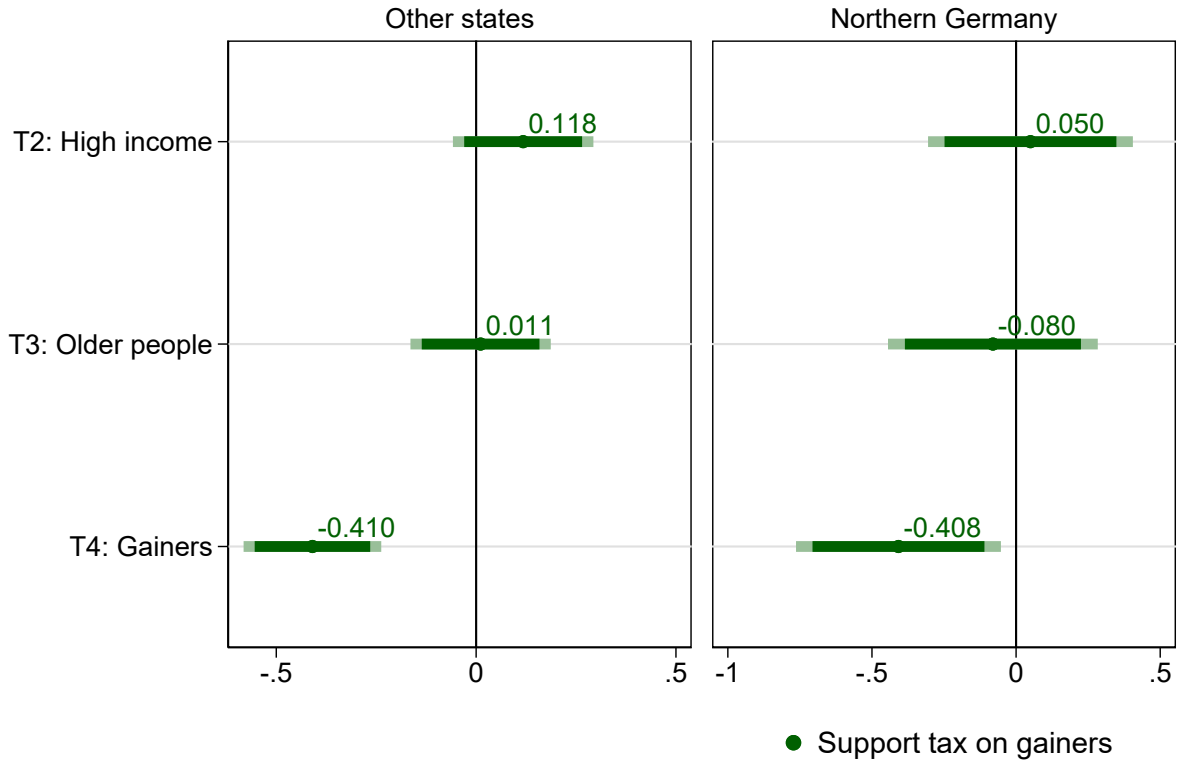
Notes: Split by answer to question "In your opinion, how high do you think the taxation on inheritances should be?" "Low taxation" refers to participants answering with an number of 0 to 3 on the slider defined between 0 and 10 (with 0 meaning no taxation at all and 10 meaning very high taxation). "Intermediate taxation" refers to participants answering between 4 and 6 and "high taxing" refers to participants answering between 7 and 10 on the same slider.

Figure A.11: Support for higher debt burden: Heterogeneity by tax preferences on inheritances



Notes: Split by answer to question "In your opinion, how high do you think the taxation on inheritances should be?" "Low taxation" refers to participants answering with an number of 0 to 3 on the slider defined between 0 and 10 (with 0 meaning no taxation at all and 10 meaning very high taxation). "Intermediate taxation" refers to participants answering between 4 and 6 and "high taxing" refers to participants answering between 7 and 10 on the same slider.

Figure A.12: Support for taxing the gainers: Heterogeneity by region of residence



Notes: The figures show treatment effects by heterogeneity in the region of residence. The lines represent the 90% (transparent horizontal lines) and 95% (non-transparent horizontal lines) confidence intervals. "Northern Germany" includes participants from the federal states of Schleswig Holstein, Hamburg, Bremen, Lower Saxony and Mecklenburg Western Pomerania. "Other states" refers to individuals residing in other German states.